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# Dairy Herd Improvement Letter

Vol. 57, No.1



April 1981

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U.S. Department of Agriculture  
Science and Education Administration

U.S. DEPARTMENT OF AGRICULTURE  
SCIENCE AND EDUCATION ADMINISTRATION  
CURRENT STATE OF RECORDS

NOV 23 '81

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NOV 23 1981

Science and Education Administration, Dairy Herd Improvement Letter, Vol. 57, No. 1,  
April 1981

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Published by Agricultural Research (Northeastern Region), Science and Education  
Administration, U.S. Department of Agriculture, Beltsville, Md. 20705

## Dairy Herd Improvement Letter

### STATE AND NATIONAL STANDARDIZED LACTATION AVERAGES BY BREED FOR COWS ON OFFICIAL TEST, CALVING IN 1978

By Rex L. Powell<sup>1</sup>

Dairy records processing centers provide lactation records to USDA for research that includes genetic evaluations. These evaluations only use records from cows on official test. Nearly half of the official records are not used because of missing sire identification or failure to pass USDA edits.<sup>2 3</sup> The number and average standardized production of lactations initiated in 1978 that contributed to genetic evaluations are reported by State in table 1 for Ayrshire, Guernsey, and Holstein cows and in table 2 for Jersey, Brown Swiss, and Milking Shorthorn cows. Records were standardized for age and month of calving<sup>4</sup> and times milked per day.<sup>5</sup> Incomplete records were projected to 305 days.<sup>6</sup> Thus, the averages presented are on a 305-day, 2X, mature-equivalent basis. This is the first report of lactation averages with incomplete records projected by the factors of Wiggans and Powell.<sup>6</sup> Fat percentages were computed from the average standardized milk and fat yields.

The number of records increased by 3 percent over 1977 numbers primarily because of a 3 percent increase for Holstein records. There were also increases for Jersey (3 percent) and Milking Shorthorn (6 percent) records, but Brown Swiss numbers remained about the same. The number of Ayrshire records decreased by 2 percent from 1977 but

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<sup>1</sup> Research geneticist (animal), Animal Improvement Programs Laboratory, Animal Science Institute, Beltsville Agricultural Research Center, Beltsville, Md. 20705.

<sup>2</sup> Wiggans, G. R. Errors, reasons for termination, and types of test for 305-day lactation records received for the Summer 1978 through Winter 1980 Sire Summaries. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 56(6), pp. 7-13. 1980.

<sup>3</sup> U.S. Department of Agriculture. Editing of lactation records used in USDA-DHIA genetic evaluations of sires and cows. U.S. Dept. Agr. Dairy Herd Impr. Ltr. ARS-44-222, 46(6), 32 pp. 1970.

<sup>4</sup> Norman, H. D., Miller, P. D., McDaniel, B. T., and others. USDA-DHIA factors for standardizing 305-day lactation records for age and month of calving. U.S. Dept. Agr. ARS-NE-40, 91 pp. 1974.

<sup>5</sup> U.S. Department of Agriculture. Reducing records to a twice-a-day milking basis. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 48(1), pp. 3-8. 1972.

<sup>6</sup> Wiggans, G. R., and Powell, R. L. Projection factors for milk and fat lactation records. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 56(1), 15 pp. 1980.

was greater than for each of the preceding 4 years. The number of Guernsey records declined by 29 percent from 1971 to 1977.<sup>7</sup> That trend continued in 1978, with a decline of 3,593 records (6 percent).

Average milk production (pounds) increased modestly for Ayrshires (+144), Guernseys (+91), Holsteins (+168), and Jerseys (+124) but decreased slightly for Brown Swiss (-12) and Milking Shorthorns (-33). Average fat yield was the same in 1978 as in 1977 for Milking Shorthorns but increased for all other breeds. Holsteins increased the most, 8 pounds. All breeds increased in fat percentage following a drop of about 0.03 percent in 1977.

A comparison of national averages for 1971 through 1977 has been published.<sup>7</sup> Changes in averages and numbers of records for particular State and breed combinations may be studied by comparing tables 1 and 2 with tables in the report<sup>7</sup> for 1977 and in corresponding publications for earlier years.

Cows of the Red and White breed are not included in the tables because of small numbers. Nationally, the 687 Red and White cows averaged 15,193 pounds of milk, 3.62 percent fat, and 550 pounds of fat. The averages for 251 cows in 1977 were 14,299 pounds of milk, 3.60 percent fat, and 513 pounds of fat.

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<sup>7</sup> Powell, R. L. State and national standardized lactation averages by breed for cows on official test, calving in 1977. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 56(2), pp. 1-6. 1980.

Table 1.--State and national standardized lactation averages for Ayrshire, Guernsey, and Holstein cows on official test, calving in 1978<sup>1</sup>

| State                        | Ayrshire |        |         |        | Guernsey |        |         |        | Holstein  |        |         |        |
|------------------------------|----------|--------|---------|--------|----------|--------|---------|--------|-----------|--------|---------|--------|
|                              | Records  | Milk   | Fat     | Fat    | Records  | Milk   | Fat     | Fat    | Records   | Milk   | Fat     | Fat    |
|                              | Number   | Pounds | Percent | Pounds | Number   | Pounds | Percent | Pounds | Number    | Pounds | Percent | Pounds |
| Alabama-----                 | 70       | 11,919 | 3.53    | 421    | 160      | 10,911 | 4.25    | 463    | 4,965     | 15,689 | 3.49    | 547    |
| Alaska-----                  | --       | --     | --      | --     | --       | --     | --      | --     | 58        | 14,377 | 3.69    | 530    |
| Arizona-----                 | --       | --     | --      | --     | 1,170    | 12,156 | 4.45    | 541    | 5,926     | 17,341 | 3.48    | 604    |
| Arkansas-----                | 11       | 10,106 | 3.98    | 402    | 200      | 10,714 | 4.41    | 473    | 2,669     | 15,564 | 3.37    | 525    |
| California-----              | 206      | 14,311 | 3.97    | 569    | 2,433    | 12,333 | 4.50    | 555    | 120,940   | 18,246 | 3.59    | 654    |
| Colorado-----                | 33       | 12,035 | 3.87    | 466    | 208      | 10,955 | 4.64    | 508    | 8,733     | 16,725 | 3.47    | 580    |
| Connecticut-----             | 508      | 12,447 | 3.99    | 496    | 746      | 11,218 | 4.65    | 521    | 13,123    | 16,523 | 3.68    | 608    |
| Delaware-----                | 212      | 9,376  | 4.22    | 396    | 11       | 12,545 | 4.90    | 615    | 2,428     | 16,865 | 3.60    | 607    |
| Florida-----                 | 156      | 12,005 | 3.53    | 424    | 573      | 9,218  | 4.13    | 381    | 2,536     | 15,628 | 3.20    | 500    |
| Georgia-----                 | 112      | 12,271 | 3.77    | 462    | 661      | 11,413 | 4.58    | 523    | 8,481     | 15,540 | 3.55    | 552    |
| Hawaii-----                  | --       | --     | --      | --     | 1        | 9,830  | 3.36    | 330    | 1,270     | 16,140 | 3.26    | 526    |
| Idaho-----                   | 73       | 11,965 | 3.74    | 447    | 415      | 10,621 | 4.51    | 479    | 9,509     | 16,653 | 3.53    | 588    |
| Illinois-----                | 492      | 12,303 | 3.86    | 475    | 1,443    | 10,271 | 4.63    | 476    | 29,960    | 15,901 | 3.67    | 583    |
| Indiana-----                 | 367      | 12,608 | 3.90    | 491    | 3,206    | 11,261 | 4.73    | 533    | 22,763    | 16,298 | 3.69    | 602    |
| Iowa-----                    | 1,396    | 11,684 | 3.85    | 450    | 1,921    | 10,371 | 4.62    | 479    | 29,813    | 15,208 | 3.60    | 548    |
| Kansas-----                  | 493      | 11,206 | 3.85    | 431    | 571      | 10,703 | 4.60    | 492    | 21,764    | 15,541 | 3.52    | 547    |
| Kentucky-----                | 195      | 10,767 | 3.73    | 402    | 510      | 9,735  | 4.53    | 441    | 8,862     | 15,601 | 3.55    | 553    |
| Louisiana-----               | 145      | 11,177 | 3.78    | 423    | 1,268    | 9,870  | 4.31    | 425    | 7,088     | 14,538 | 3.34    | 485    |
| Maine-----                   | 456      | 12,141 | 3.84    | 466    | 277      | 10,794 | 4.58    | 494    | 14,235    | 16,301 | 3.57    | 581    |
| Maryland-----                | 537      | 11,199 | 3.93    | 440    | 1,112    | 10,453 | 4.72    | 493    | 27,016    | 16,243 | 3.65    | 592    |
| Massachusetts---             | 612      | 11,890 | 3.97    | 472    | 349      | 11,292 | 4.56    | 516    | 11,264    | 16,423 | 3.61    | 593    |
| Michigan-----                | 99       | 12,369 | 3.75    | 464    | 1,856    | 11,692 | 4.67    | 546    | 45,268    | 16,981 | 3.68    | 625    |
| Minnesota-----               | 980      | 11,672 | 3.88    | 453    | 3,961    | 10,443 | 4.67    | 488    | 100,301   | 15,593 | 3.65    | 570    |
| Mississippi-----             | 175      | 11,810 | 3.65    | 432    | 255      | 11,421 | 4.20    | 479    | 4,497     | 15,543 | 3.41    | 530    |
| Missouri-----                | 89       | 11,864 | 3.84    | 455    | 1,663    | 10,356 | 4.54    | 470    | 17,008    | 15,343 | 3.53    | 542    |
| Montana-----                 | 136      | 13,987 | 3.78    | 529    | 70       | 12,215 | 4.81    | 587    | 1,385     | 15,865 | 3.48    | 552    |
| Nebraska-----                | 100      | 10,228 | 4.01    | 410    | 472      | 10,547 | 4.58    | 483    | 10,302    | 14,938 | 3.57    | 533    |
| Nevada-----                  | --       | --     | --      | --     | --       | --     | --      | --     | 846       | 17,301 | 3.33    | 576    |
| New Hampshire---             | 568      | 12,606 | 3.91    | 493    | 134      | 10,548 | 4.48    | 473    | 7,229     | 16,394 | 3.62    | 594    |
| New Jersey-----              | 52       | 10,847 | 3.88    | 421    | 166      | 11,016 | 4.65    | 512    | 9,502     | 16,462 | 3.69    | 607    |
| New Mexico-----              | 112      | 13,618 | 3.72    | 506    | 464      | 12,964 | 4.39    | 569    | 6,445     | 17,065 | 3.49    | 595    |
| New York-----                | 3,454    | 12,621 | 3.97    | 501    | 2,490    | 11,226 | 4.63    | 520    | 136,022   | 16,649 | 3.65    | 607    |
| North Carolina---            | 255      | 12,686 | 3.64    | 462    | 667      | 10,906 | 4.55    | 496    | 24,615    | 16,683 | 3.48    | 580    |
| North Dakota---              | --       | --     | --      | --     | 13       | 8,896  | 4.52    | 402    | 3,016     | 14,604 | 3.56    | 520    |
| Ohio-----                    | 1,131    | 12,611 | 3.80    | 480    | 2,811    | 11,395 | 4.62    | 526    | 42,353    | 17,001 | 3.62    | 615    |
| Oklahoma-----                | 305      | 11,814 | 3.93    | 464    | 448      | 11,994 | 4.65    | 558    | 6,180     | 16,293 | 3.55    | 578    |
| Oregon-----                  | 342      | 12,001 | 3.96    | 475    | 1,058    | 11,097 | 4.63    | 513    | 11,170    | 17,021 | 3.61    | 615    |
| Pennsylvania---              | 1,411    | 13,181 | 3.96    | 522    | 4,642    | 11,242 | 4.67    | 525    | 120,888   | 16,626 | 3.70    | 614    |
| Puerto Rico <sup>2</sup> --- | --       | --     | --      | --     | --       | --     | --      | --     | 1,719     | 11,033 | 2.97    | 328    |
| Rhode Island---              | 103      | 12,607 | 3.84    | 485    | 42       | 8,508  | 4.66    | 397    | 703       | 16,167 | 3.55    | 573    |
| South Carolina---            | --       | --     | --      | --     | 1,692    | 11,619 | 4.60    | 534    | 6,132     | 16,225 | 3.56    | 578    |
| South Dakota---              | 18       | 12,624 | 3.97    | 501    | 31       | 10,669 | 5.14    | 549    | 5,162     | 15,071 | 3.62    | 546    |
| Tennessee-----               | 107      | 11,994 | 3.81    | 457    | 639      | 10,887 | 4.52    | 493    | 11,888    | 16,462 | 3.65    | 601    |
| Texas-----                   | 14       | 9,909  | 3.97    | 393    | 310      | 11,662 | 4.47    | 522    | 13,219    | 16,550 | 3.47    | 574    |
| Utah-----                    | 8        | 12,228 | 3.70    | 452    | 1        | 12,870 | 3.40    | 438    | 9,643     | 17,337 | 3.41    | 591    |
| Vermont-----                 | 1,408    | 12,771 | 3.86    | 492    | 498      | 10,990 | 4.61    | 507    | 27,481    | 16,090 | 3.57    | 575    |
| Virginia-----                | 538      | 12,401 | 3.67    | 455    | 1,877    | 10,626 | 4.59    | 488    | 44,057    | 16,148 | 3.54    | 572    |
| Washington-----              | 374      | 13,868 | 4.04    | 559    | 2,310    | 12,048 | 4.73    | 570    | 23,163    | 17,752 | 3.53    | 626    |
| West Virginia---             | 300      | 11,323 | 4.18    | 473    | 230      | 9,539  | 4.71    | 450    | 6,756     | 15,891 | 3.50    | 557    |
| Wisconsin-----               | 943      | 12,362 | 3.91    | 483    | 6,587    | 11,114 | 4.66    | 518    | 130,461   | 16,480 | 3.76    | 619    |
| Wyoming-----                 | 1        | 14,660 | 3.85    | 564    | 31       | 15,338 | 4.42    | 677    | 954       | 15,518 | 3.38    | 524    |
| United States----            | 19,097   | 12,311 | 3.90    | 480    | 52,653   | 11,094 | 4.61    | 512    | 1,181,768 | 16,522 | 3.62    | 599    |

<sup>1</sup> Dashes indicate no lactation records reported.

<sup>2</sup> Puerto Rican data are included in USDA national standardized lactation averages.

Table 2.--State and national standardized lactation averages for Jersey, Brown Swiss, and Milking Shorthorn cows on official test, calving in 1978<sup>1</sup>

| State                          | Jersey  |        |         |        | Brown Swiss |        |         |        | Milking Shorthorn |        |         |        |
|--------------------------------|---------|--------|---------|--------|-------------|--------|---------|--------|-------------------|--------|---------|--------|
|                                | Records | Milk   | Fat     | Fat    | Records     | Milk   | Fat     | Fat    | Records           | Milk   | Fat     | Fat    |
|                                | Number  | Pounds | Percent | Pounds | Number      | Pounds | Percent | Pounds | Number            | Pounds | Percent | Pounds |
| Alabama-----                   | 2,117   | 12,021 | 4.46    | 536    | 176         | 11,577 | 3.90    | 451    | ---               | ---    | ---     | ---    |
| Alaska-----                    | ---     | ---    | ---     | ---    | ---         | ---    | ---     | ---    | ---               | ---    | ---     | ---    |
| Arizona-----                   | 1,030   | 10,882 | 4.82    | 524    | 940         | 15,051 | 3.82    | 575    | 37                | 11,979 | 3.45    | 413    |
| Arkansas-----                  | 727     | 9,867  | 4.69    | 463    | 43          | 14,298 | 3.72    | 531    | 48                | 13,820 | 3.64    | 502    |
| California-----                | 6,180   | 11,636 | 5.02    | 584    | 623         | 14,928 | 4.10    | 613    | 158               | 12,968 | 3.59    | 465    |
| Colorado-----                  | 351     | 10,864 | 4.73    | 514    | 428         | 14,428 | 4.08    | 588    | 36                | 10,469 | 3.53    | 370    |
| Connecticut-----               | 373     | 10,315 | 4.98    | 514    | 216         | 13,734 | 3.92    | 539    | 7                 | 11,320 | 3.51    | 398    |
| Delaware-----                  | 27      | 10,139 | 4.33    | 439    | 8           | 16,270 | 4.17    | 679    | ---               | ---    | ---     | ---    |
| Florida-----                   | 849     | 10,328 | 4.26    | 440    | 505         | 11,725 | 3.61    | 423    | ---               | ---    | ---     | ---    |
| Georgia-----                   | 1,468   | 10,127 | 4.88    | 494    | 299         | 13,753 | 3.90    | 536    | ---               | ---    | ---     | ---    |
| Hawaii-----                    | ---     | ---    | ---     | ---    | 1           | 13,000 | 4.30    | 559    | ---               | ---    | ---     | ---    |
| Idaho-----                     | 1,047   | 10,386 | 4.84    | 503    | 111         | 13,934 | 3.94    | 548    | ---               | ---    | ---     | ---    |
| Illinois-----                  | 945     | 9,318  | 4.91    | 457    | 1,199       | 13,003 | 4.03    | 525    | 96                | 11,615 | 3.53    | 410    |
| Indiana-----                   | 1,522   | 9,704  | 4.92    | 477    | 790         | 14,353 | 4.04    | 580    | 48                | 10,285 | 3.82    | 392    |
| Iowa-----                      | 2,072   | 9,807  | 4.75    | 466    | 3,065       | 13,201 | 4.01    | 529    | 384               | 10,576 | 3.62    | 383    |
| Kansas-----                    | 528     | 10,065 | 4.65    | 468    | 288         | 12,388 | 3.94    | 488    | 5                 | 13,008 | 3.57    | 464    |
| Kentucky-----                  | 1,938   | 10,293 | 4.79    | 493    | 293         | 11,363 | 3.82    | 434    | 8                 | 13,136 | 3.36    | 442    |
| Louisiana-----                 | 1,865   | 9,689  | 4.59    | 445    | 136         | 11,076 | 3.56    | 394    | ---               | ---    | ---     | ---    |
| Maine-----                     | 1,220   | 11,759 | 4.75    | 559    | 67          | 12,010 | 3.91    | 470    | 96                | 9,710  | 3.64    | 354    |
| Maryland-----                  | 510     | 8,547  | 4.87    | 416    | 243         | 12,511 | 3.99    | 500    | 29                | 10,154 | 3.70    | 375    |
| Massachusetts-----             | 1,043   | 10,441 | 4.94    | 516    | 51          | 13,435 | 3.80    | 512    | 28                | 10,423 | 3.76    | 392    |
| Michigan-----                  | 1,544   | 10,397 | 4.99    | 519    | 331         | 13,796 | 4.06    | 560    | 94                | 11,880 | 3.31    | 394    |
| Minnesota-----                 | 2,105   | 9,964  | 4.89    | 487    | 1,348       | 12,995 | 4.03    | 524    | 539               | 11,851 | 3.64    | 431    |
| Mississippi-----               | 1,680   | 9,931  | 4.52    | 449    | 12          | 13,210 | 3.79    | 495    | ---               | ---    | ---     | ---    |
| Missouri-----                  | 1,716   | 10,032 | 4.73    | 474    | 491         | 12,386 | 3.93    | 487    | 167               | 10,805 | 3.73    | 403    |
| Montana-----                   | 11      | 8,437  | 4.85    | 409    | 29          | 12,367 | 4.14    | 512    | ---               | ---    | ---     | ---    |
| Nebraska-----                  | 176     | 9,175  | 4.63    | 425    | 505         | 12,567 | 4.21    | 529    | 155               | 9,652  | 3.71    | 358    |
| Nevada-----                    | 456     | 12,035 | 4.74    | 570    | ---         | ---    | ---     | ---    | ---               | ---    | ---     | ---    |
| New Hampshire-----             | 1,023   | 10,916 | 4.83    | 527    | 92          | 11,970 | 3.93    | 470    | 5                 | 10,116 | 3.54    | 352    |
| New Jersey-----                | 276     | 11,292 | 4.81    | 542    | 116         | 13,970 | 3.89    | 543    | ---               | ---    | ---     | ---    |
| New Mexico-----                | 10      | 11,583 | 5.19    | 601    | 11          | 13,708 | 3.91    | 535    | ---               | ---    | ---     | ---    |
| New York-----                  | 4,360   | 10,442 | 4.99    | 521    | 1,551       | 13,599 | 4.03    | 548    | 60                | 11,814 | 3.57    | 422    |
| North Carolina-----            | 1,830   | 10,356 | 4.77    | 494    | 241         | 13,036 | 3.94    | 514    | 1                 | 11,120 | 4.33    | 481    |
| North Dakota-----              | 44      | 8,201  | 5.06    | 415    | 184         | 13,455 | 4.03    | 541    | 9                 | 9,764  | 3.56    | 347    |
| Ohio-----                      | 4,427   | 10,655 | 4.95    | 527    | 1,455       | 14,690 | 4.09    | 601    | 135               | 11,851 | 3.84    | 455    |
| Oklahoma-----                  | 528     | 9,832  | 5.01    | 493    | 239         | 11,737 | 4.01    | 471    | 151               | 12,709 | 3.57    | 454    |
| Oregon-----                    | 3,498   | 10,911 | 5.03    | 549    | 722         | 13,439 | 4.07    | 547    | 17                | 10,312 | 3.66    | 383    |
| Pennsylvania-----              | 4,055   | 10,417 | 4.90    | 510    | 807         | 13,549 | 4.03    | 546    | 83                | 10,662 | 3.67    | 391    |
| Puerto Rico <sup>2</sup> ----- | ---     | ---    | ---     | ---    | 3           | 10,257 | 3.07    | 316    | ---               | ---    | ---     | ---    |
| Rhode Island-----              | 2       | 9,200  | 4.98    | 459    | 4           | 11,562 | 3.76    | 436    | ---               | ---    | ---     | ---    |
| South Carolina-----            | 3,804   | 11,438 | 4.84    | 554    | 50          | 16,997 | 3.75    | 637    | ---               | ---    | ---     | ---    |
| South Dakota-----              | 119     | 9,622  | 5.20    | 500    | 283         | 12,287 | 4.11    | 505    | 75                | 9,521  | 3.61    | 344    |
| Tennessee-----                 | 4,005   | 10,821 | 4.84    | 524    | 485         | 13,232 | 4.04    | 535    | ---               | ---    | ---     | ---    |
| Texas-----                     | 3,640   | 10,774 | 4.58    | 493    | 1,317       | 14,088 | 3.87    | 546    | 31                | 10,429 | 3.46    | 361    |
| Utah-----                      | 586     | 11,202 | 4.82    | 540    | 102         | 13,328 | 3.95    | 527    | 1                 | 17,210 | 4.17    | 718    |
| Vermont-----                   | 5,290   | 10,773 | 4.80    | 515    | 134         | 14,300 | 3.82    | 547    | 36                | 11,623 | 3.52    | 409    |
| Virginia-----                  | 757     | 10,766 | 4.89    | 526    | 158         | 13,144 | 3.85    | 506    | 9                 | 11,253 | 3.58    | 402    |
| Washington-----                | 3,484   | 11,566 | 5.05    | 584    | 301         | 14,001 | 3.94    | 551    | 42                | 14,866 | 3.49    | 519    |
| West Virginia-----             | 342     | 11,258 | 4.81    | 542    | 1           | 15,980 | 3.52    | 562    | ---               | ---    | ---     | ---    |
| Wisconsin-----                 | 2,763   | 10,116 | 4.88    | 493    | 3,016       | 13,579 | 4.05    | 550    | 265               | 11,994 | 3.64    | 437    |
| Wyoming-----                   | 40      | 10,437 | 4.40    | 459    | 5           | 11,168 | 3.77    | 424    | ---               | ---    | ---     | ---    |
| United States-----             | 78,383  | 10,670 | 4.85    | 517    | 23,475      | 13,490 | 4.00    | 539    | 2,855             | 11,415 | 3.62    | 414    |

<sup>1</sup> Dashes indicate no lactation records reported.

<sup>2</sup> Puerto Rican data are included in USDA national standardized lactation averages.

## AVERAGES OF PREDICTED DIFFERENCES BY SUMMARY DATE, BREED, AND BULL STATUS

By Rex L. Powell and George R. Wiggans<sup>1</sup>

Average Predicted Differences (PD's) of bulls by Summary date have been of interest to the dairy industry. Average PD's for milk (PDM's) and dollars (PD\$'s) for bulls in active artificial insemination (AI) service have been reported for one USDA-DHIA Sire Summary each year through 1978 (5, 6, 7). Averages for both Winter and Summer Sire Summaries in 1979 and 1980 were reported recently (1). That report also included PD's for fat percentage (PD%'s) and fat yield (PDF's) and categories for non-AI bulls and all bulls. Similar data have been distributed with each active AI list since the Fall 1976 Sire Summary, but there were no published data on all four PD's or for non-AI or all bulls before 1979. The tabular data in this report provide averages for the four PD's and four categories of bulls (all, active AI, inactive AI, and non-AI) for all Summaries computed by the Modified Contemporary Comparison (MCC).

The following points should be considered when comparing average PD's of bulls summarized:

(1) Resummary requirements permit most bulls to be resummarized only when the amount of additional information on daughters meets the minimum requirement (4). When stricter requirements are imposed, only bulls with substantial increases in amounts of daughter information are resummarized. These bulls are younger and have higher PD's than bulls summarized under relaxed requirements. The resummary requirements have changed during the period covered in this report.

(2) The definition of an active AI bull has changed. Stricter definitions tend to increase average PD's for active AI bulls. Beginning with the Winter (January) 1979 Sire Summaries, AI organizations were able to add or delete any of their bulls from the active AI list after examining current Summaries.

(3) Comparison of average PD's from a particular Summary exaggerates the difference between non-AI and active AI bulls. Active AI bulls are selected to be on the list, but comparable selection of non-AI bulls is not done. Non-AI bulls tend to be older than active AI bulls and often may not have been available for service for years. The contribution of non-AI sampled bulls is not evident by comparing averages, because the best non-AI bulls move to active AI status and most of the remaining non-AI bulls are used because of the convenience of natural service rather than for genetic improvement. Better comparisons of AI and non-AI bull sampling programs (3) and average merit of sires of AI and non-AI daughters (2) have been reported.

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(4) Changes in the averages of bulls summarized suggest genetic change; however, changes in these averages are an imprecise measure. The data used in the Summaries are not representative of any specific time and are subject to changes in requirements for resummary (4). Also, the averages do not account for differential usage of bulls, which is necessary in estimating genetic trends (2).

Averages in tables 1 and 2 are for all, active AI, inactive AI, and non-AI bulls. Previously there were no separate averages for inactive AI bulls, but the averages except for PD% could have been computed from the other averages distributed with the active AI list. Active AI bulls were those designated as active by the controlling organization. Inactive AI bulls had a stud code and had entered the stud at least 3 months prior to the Summary date but were not in active service at the time of the Summary. All other bulls were given non-AI status.

The Fall (October) 1974 Sire Summary's numbers of bulls were higher and averages lower than for other Summaries, because the MCC was used for the first time and all bulls were summarized. Thereafter, bulls not in active AI service have had to meet certain requirements for resummary. The spring (May) 1977 resummary requirements were relaxed in order to update evaluations on additional bulls so that Summaries would continue to be comparable. The number of bulls summarized in that run increased for all breeds and more than doubled for breeds other than Holstein. The resummation of additional, generally older bulls decreased the average PDM and PDF for all breeds. Number of active AI bulls decreased and their average PDM and PDF increased with the Summer 1978 Sire Summary because of adoption of a more restrictive definition of active status by the National Association of Animal Breeders.

The PD\$ values combine PDM and PDF into an economic index according to the national average milk price that is revised annually. Thus, comparisons of PD\$ averages over years are affected by changing prices unless recalculated using a single price. The PD\$'s in tables 1 and 2 were computed with the price and differential used for the 1981 Sire Summaries ( $PD\$ = \$0.0673 \text{ PDM} + \$1.62 \text{ PDF}$ ).

Average PD's for yield are increasing with each Summary. The most important increases are those for active AI bulls. Those bulls are the ones widely available and are the main contributors to genetic progress. Although we recommend that dairymen select the highest ranking bulls available as service sires, the average PD's of active AI bulls are useful guides for determining how a particular bull ranks when compared with other available bulls.

Table 1.— Average Predicted Difference (PD) for milk (PDM) in pounds, fat percentage (PD%), fat (PDF) in pounds, and dollars (PDS) for Ayrshire, Guernsey, Holstein, and Jersey bulls in the USDA-DHIA Sire Summaries

| Summary date | All bulls |      |      |     |                  | Active AI bulls |        |       |     |                  | Inactive AI bulls <sup>1</sup> |      |       |     |                  | Non-AI bulls |      |      |     |                  |
|--------------|-----------|------|------|-----|------------------|-----------------|--------|-------|-----|------------------|--------------------------------|------|-------|-----|------------------|--------------|------|------|-----|------------------|
|              | Number    | PDM  | PD%  | PDF | PDS <sup>2</sup> | Number          | PDM    | PD%   | PDF | PDS <sup>2</sup> | Number                         | PDM  | PD%   | PDF | PDS <sup>2</sup> | Number       | PDM  | PD%  | PDF | PDS <sup>2</sup> |
| Ayrshire     |           |      |      |     |                  |                 |        |       |     |                  |                                |      |       |     |                  |              |      |      |     |                  |
| 10/74---     | 1,852     | -169 | 0.00 | -6  | -21              | 22              | +475   | -0.02 | +16 | +58              | 228                            | -57  | +0.01 | -1  | -5               | 1,602        | -194 | 0.00 | -7  | -24              |
| 5/75---      | 183       | -5   | ~0.1 | -1  | -1               | 21              | +520   | ~0.3  | +18 | +64              | 26                             | +64  | ~0.1  | +1  | +6               | 136          | -86  | ~0.1 | -4  | -12              |
| 9/75---      | 227       | -11  | ~0.1 | -1  | -2               | 20              | +512   | ~0.4  | +16 | +60              | 30                             | +41  | ~0.1  | +1  | +4               | 177          | -79  | ~0.0 | -3  | -10              |
| 1/76---      | 210       | -3   | ~0.1 | -1  | -2               | 19              | +523   | ~0.3  | +18 | +64              | 29                             | +60  | ~0.1  | -2  | -7               | 162          | -76  | ~0.0 | -3  | -10              |
| 5/76---      | 185       | +80  | ~0.1 | +2  | +9               | 22              | +516   | ~0.2  | +18 | +64              | 28                             | +70  | ~0.1  | -2  | +8               | 135          | +11  | ~0.1 | 0   | +1               |
| 9/76---      | 178       | +57  | ~0.1 | +1  | +5               | 23              | +521   | ~0.2  | +18 | +64              | 24                             | -32  | ~0.0  | -1  | -4               | 131          | -9   | ~0.1 | -1  | -2               |
| 1/77---      | 195       | +34  | ~0.1 | +1  | +4               | 26              | +464   | ~0.2  | +16 | +57              | 26                             | -12  | ~0.0  | -1  | -2               | 143          | -36  | ~0.1 | -2  | -6               |
| 5/77---      | 443       | -37  | ~0.0 | -2  | -6               | 25              | +504   | ~0.2  | +18 | +63              | 43                             | +28  | ~0.0  | -2  | +5               | 375          | -80  | ~0.0 | -3  | -10              |
| 9/77---      | 182       | +60  | ~0.1 | +2  | +7               | 23              | +595   | ~0.4  | +19 | +71              | 29                             | -24  | ~0.1  | -1  | -3               | 130          | -15  | ~0.1 | -1  | -3               |
| 1/78---      | 214       | +23  | ~0.1 | 0   | +2               | 25              | +527   | ~0.3  | +18 | +65              | 30                             | -5   | +0.1  | +1  | +1               | 159          | -51  | ~0.1 | -2  | -7               |
| 7/78---      | 252       | +22  | ~0.1 | 0   | +1               | 14              | +581   | ~0.2  | +21 | +73              | 38                             | +49  | +0.1  | -3  | +8               | 200          | -22  | ~0.1 | -2  | -5               |
| 1/79---      | 298       | +25  | ~0.0 | +1  | +3               | 17              | +534   | ~0.2  | +19 | +67              | 38                             | +85  | +0.1  | -2  | +9               | 243          | -20  | +0.1 | 0   | -1               |
| 7/79---      | 285       | +34  | ~0.0 | +1  | +4               | 20              | +570   | ~0.2  | +20 | +71              | 35                             | +122 | ~0.0  | +1  | +10              | 230          | -26  | +0.1 | 0   | -2               |
| 1/80---      | 301       | +65  | ~0.0 | +3  | +9               | 16              | +568   | ~0.3  | +19 | +69              | 41                             | +142 | +0.1  | -6  | +19              | 244          | +19  | ~0.0 | +1  | +3               |
| 7/80---      | 279       | +73  | ~0.0 | +3  | +10              | 17              | +603   | ~0.3  | +21 | +75              | 27                             | +227 | ~0.2  | +7  | +27              | 235          | +17  | ~0.0 | +1  | +3               |
| 1/81---      | 266       | +116 | ~0.1 | +4  | +14              | 17              | +604   | ~0.3  | +21 | +75              | 25                             | +214 | ~0.2  | +8  | +27              | 224          | +68  | ~0.1 | +2  | +8               |
| Guernsey     |           |      |      |     |                  |                 |        |       |     |                  |                                |      |       |     |                  |              |      |      |     |                  |
| 10/74---     | 9,259     | -94  | +0.1 | -4  | -13              | 85              | +296   | ~0.3  | +11 | +38              | 1,289                          | -20  | ~0.0  | -1  | -3               | 7,885        | -110 | +0.1 | -4  | -14              |
| 5/75---      | 488       | +47  | ~0.0 | +2  | +6               | 77              | +387   | ~0.3  | +16 | +52              | 43                             | +54  | ~0.2  | +1  | +5               | 368          | -25  | ~0.0 | -1  | -3               |
| 9/75---      | 744       | -6   | ~0.0 | +1  | +2               | 80              | +383   | ~0.3  | +15 | +50              | 64                             | +44  | +0.1  | -3  | +8               | 600          | -68  | ~0.0 | -1  | -5               |
| 1/76---      | 662       | +48  | ~0.1 | +2  | +6               | 87              | +379   | ~0.4  | +15 | +50              | 53                             | +46  | ~0.1  | +1  | +5               | 522          | -7   | ~0.1 | 0   | 0                |
| 5/76---      | 534       | +72  | ~0.1 | +2  | +8               | 73              | +428   | ~0.5  | +16 | +55              | 54                             | +115 | ~0.2  | +4  | +14              | 407          | +2   | ~0.1 | 0   | 0                |
| 9/76---      | 542       | +85  | ~0.2 | +3  | +11              | 81              | +423   | ~0.5  | +16 | +54              | 50                             | +103 | ~0.2  | -3  | +12              | 411          | +17  | ~0.1 | 0   | +1               |
| 1/77---      | 627       | +54  | ~0.1 | +2  | +7               | 90              | +409   | ~0.5  | +15 | +52              | 51                             | +114 | ~0.2  | +4  | +14              | 486          | -18  | ~0.1 | -1  | -3               |
| 5/77---      | 1,506     | -4   | ~0.1 | 0   | 0                | 78              | +466   | ~0.6  | +16 | +57              | 158                            | +64  | ~0.1  | -2  | +8               | 1,270        | -32  | ~0.0 | -1  | -4               |
| 9/77---      | 493       | +114 | ~0.2 | +4  | +14              | 66              | +552   | ~0.7  | +19 | +68              | 61                             | +181 | ~0.2  | +7  | +21              | 366          | +24  | ~0.1 | 0   | -2               |
| 1/78---      | 570       | +89  | ~0.2 | +3  | +11              | 64              | +592   | ~0.7  | +22 | +75              | 67                             | +92  | ~0.2  | +3  | +11              | 439          | +16  | ~0.1 | 0   | +1               |
| 7/78---      | 729       | +98  | ~0.2 | +3  | +11              | 51              | +637   | ~0.6  | +24 | +82              | 90                             | +194 | ~0.3  | -6  | +23              | 588          | +37  | ~0.1 | -1  | -4               |
| 1/79---      | 760       | +88  | ~0.1 | +3  | +11              | 42              | +703   | ~0.6  | +27 | +91              | 118                            | +210 | ~0.4  | +6  | +24              | 600          | +21  | ~0.1 | 0   | +1               |
| 7/79---      | 767       | +101 | ~0.2 | +3  | +12              | 42              | +749   | ~0.7  | +28 | +96              | 112                            | +214 | ~0.3  | -7  | -26              | 613          | +36  | ~0.1 | +1  | +4               |
| 1/80---      | 709       | +115 | ~0.0 | +5  | +16              | 39              | +727   | ~0.6  | +28 | +94              | 100                            | +235 | ~0.2  | +8  | +29              | 570          | +52  | +0.1 | +3  | +8               |
| 7/80---      | 691       | +159 | ~0.2 | +6  | +20              | 44              | +785   | ~0.8  | +29 | +100             | 104                            | +301 | ~0.3  | -9  | +35              | 543          | +81  | ~0.1 | +3  | +10              |
| 1/81---      | 668       | +181 | ~0.3 | +6  | +22              | 44              | +813   | ~0.8  | +30 | +103             | 97                             | +269 | ~0.3  | -9  | +33              | 527          | +112 | ~0.2 | +3  | +12              |
| Holstein     |           |      |      |     |                  |                 |        |       |     |                  |                                |      |       |     |                  |              |      |      |     |                  |
| 10/74---     | 35,389    | -177 | ~0.0 | -7  | -23              | 779             | +368   | ~0.2  | +9  | +49              | 3,792                          | -39  | ~0.0  | -2  | -6               | 30,818       | -208 | ~0.0 | -8  | -27              |
| 5/75---      | 4,605     | -79  | ~0.1 | -5  | -13              | 771             | +416   | ~0.3  | +10 | +44              | 403                            | +75  | ~0.2  | 0   | +5               | 3,431        | -208 | ~0.0 | -9  | -29              |
| 9/75---      | 6,132     | -97  | ~0.1 | -5  | -15              | 829             | +445   | ~0.3  | +11 | +48              | 513                            | +93  | ~0.2  | 0   | +6               | 4,790        | -211 | ~0.0 | -9  | -29              |
| 1/76---      | 5,710     | -62  | ~0.2 | -5  | -12              | 878             | +436   | ~0.4  | +9  | +44              | 487                            | +101 | ~0.2  | 0   | +7               | 4,345        | -180 | ~0.1 | -8  | -25              |
| 5/76---      | 5,328     | -32  | ~0.2 | -5  | -10              | 838             | +500   | ~0.5  | +11 | +51              | 461                            | +82  | ~0.2  | -1  | +4               | 4,029        | -156 | ~0.1 | -8  | -23              |
| 9/76---      | 4,859     | -2   | ~0.2 | -4  | -7               | 887             | +510   | ~0.5  | +11 | +52              | 436                            | +176 | ~0.3  | +1  | +13              | 3,536        | -152 | ~0.1 | -8  | -23              |
| 1/77---      | 6,327     | -18  | ~0.2 | -4  | -8               | 1,011           | +480   | ~0.5  | +10 | +49              | 480                            | +122 | ~0.3  | -1  | +7               | 4,836        | -136 | ~0.1 | -8  | -22              |
| 5/77---      | 7,852     | -40  | ~0.2 | -5  | -11              | 908             | +554   | ~0.5  | +12 | +57              | 822                            | +128 | ~0.3  | 0   | +9               | 6,122        | -151 | ~0.1 | -8  | -23              |
| 9/77---      | 6,847     | +28  | ~0.3 | -3  | -3               | 896             | +652   | ~0.6  | +14 | +67              | 727                            | +167 | ~0.4  | 0   | +11              | 5,224        | -99  | ~0.2 | -7  | -18              |
| 1/78---      | 6,969     | +53  | ~0.3 | -3  | -1               | 906             | +655   | ~0.6  | +14 | +67              | 769                            | +214 | ~0.4  | +1  | +16              | 5,294        | -73  | ~0.2 | -6  | -15              |
| 7/78---      | 8,881     | +57  | ~0.3 | -2  | +1               | 658             | +764   | ~0.5  | +19 | +82              | 1,340                          | +275 | ~0.4  | +4  | +25              | 6,883        | -54  | ~0.2 | -6  | -13              |
| 1/79---      | 8,900     | +92  | ~0.3 | -1  | +5               | 667             | +880   | ~0.7  | +21 | +93              | 1,499                          | +271 | ~0.4  | +4  | +25              | 6,734        | -26  | ~0.2 | -4  | -8               |
| 7/79---      | 10,483    | +116 | ~0.3 | 0   | +8               | 686             | +928   | ~0.6  | +24 | +101             | 1,884                          | +299 | ~0.3  | +4  | +27              | 7,913        | +2   | ~0.2 | -3  | -5               |
| 1/80---      | 9,453     | +177 | ~0.3 | +2  | +15              | 725             | +977   | ~0.6  | +27 | +109             | 1,540                          | +393 | ~0.3  | +5  | +35              | 7,188        | +50  | ~0.2 | -1  | +2               |
| 7/80---      | 10,389    | +194 | ~0.3 | +3  | +18              | 723             | +1,040 | ~0.6  | +29 | +117             | 1,948                          | +419 | ~0.3  | +7  | +40              | 7,718        | +58  | ~0.1 | 0   | +4               |
| 1/81---      | 10,462    | +234 | ~0.2 | +5  | +24              | 728             | +1,094 | ~0.6  | +31 | +124             | 1,890                          | +463 | ~0.3  | +13 | +52              | 7,844        | +99  | ~0.3 | 0   | +7               |
| Jersey       |           |      |      |     |                  |                 |        |       |     |                  |                                |      |       |     |                  |              |      |      |     |                  |
| 10/74---     | 7,027     | -119 | +0.1 | -5  | -16              | 93              | +388   | ~0.6  | +14 | +49              | 896                            | -8   | +0.1  | 0   | -1               | 6,038        | -144 | +0.1 | -6  | -19              |
| 5/75---      | 564       | +29  | ~0.1 | 0   | +2               | 90              | +490   | ~0.7  | +18 | +62              | 63                             | +85  | +0.1  | +4  | +12              | 411          | -80  | ~0.0 | -4  | -12              |
| 9/75---      | 787       | 0    | ~0.1 | -1  | -2               | 100             | +523   | ~0.9  | +18 | +64              | 79                             | +153 | ~0.2  | +6  | +20              | 608          | -106 | +0.1 | -5  | -15              |
| 1/76---      | 683       | +57  | ~0.2 | +1  | +5               | 104             | +519   | ~0.9  | +18 | +64              | 72                             | +149 | ~0.1  | +6  | +20              | 507          | -51  | ~0.0 | -3  | -8               |
| 5/76---      | 585       | +141 | ~0.3 | +5  | +18              | 103             | +557   | ~0.9  | +20 | +70              | 73                             | +171 | ~0.2  | +7  | +23              | 409          | +32  | ~0.1 | 0   | +2               |
| 9/76---      | 597       | +121 | ~0.3 | +3  | +13              | 104             | +574   | ~0.9  | +21 | +73              | 58                             | +137 | ~0.3  | +4  | +16              | 435          | +11  | ~0.1 | -1  | -1               |
| 1/77---      | 702       | +142 | ~0.3 | +4  | +16              | 122             | +539   | ~0.9  | +19 | +67              | 73                             | +252 | ~0.5  | -8  | +30              | 507          | +31  | ~0.1 | 0   | +2               |
| 5/77---      | 1,673     | +17  | ~0.2 | -1  | 0                | 113             | +635   | ~0.9  | +23 | +80              | 168                            | +160 | ~0.4  | +5  | +19              | 1,392        | -50  | ~0.1 | -3  | -8               |
| 9/77---      | 677       | +212 | ~0.5 | +6  | +24              | 112             | +735   | ~1.2  | +25 | +90              | 81                             | +243 | ~0.6  | +6  | +26              | 484          | +86  | ~0.3 | +1  | -7               |
| 1/78---      | 708       | +237 | ~0.6 | +7  | +27              | 107             | +757   | ~1.3  | +26 | +93              | 96                             | +348 | ~0.8  | +9  | +38              | 505          | +106 | ~0.4 | +2  | +4               |
| 7/78---      | 997       | +215 | ~0.5 | +6  | +24              | 101             | +803   | ~1.4  | +27 | +98              | 141                            | +371 | ~0.7  | +12 | +44              | 755          | +107 | ~0.3 | +2  | +10              |
| 1/79---      | 952       | +246 | ~0.6 | +7  | +28              | 94              | +859   | ~1.6  | +28 | +103             | 155                            | +364 | ~0.7  | +12 | +44              | 703          | +138 | ~0.4 | +3  | +14              |
| 7/79---      | 1,053     | +305 | ~0.7 | +9  | +35              | 86              | +982   | ~1.7  | +33 | +120             | 184                            | +418 | ~0.9  | +12 | +48              | 783          | +204 | ~0.5 | +6  | +23              |
| 1/80---      | 1,103     | +310 | ~0.6 | +10 | +37              | 89              | +985   | ~1.7  | +33 | +120             | 249                            | +376 | ~0.7  | +14 | +48              | 765          | +210 | ~0.5 | +6  | +24              |
| 7/80---      | 1,038     | +376 | ~0.8 | +12 | +45              | 90              | +1,015 | ~1.8  | +34 | +123             | 172                            | +506 | ~1.1  | +16 | +60              | 776          | +273 | ~0.6 | +8  | +31              |
| 1/81---      | 1,064     | +396 | ~0.9 | +12 | +46              | 85              | +1,082 | ~1.8  | +37 | +133             | 153                            | +544 | ~1.0  | +17 | +64              | 826          | +298 | ~0.7 | +9  | +35              |

<sup>1</sup> The PDM and PDF values for 1979 and later Summaries of inactive AI bulls computed by difference. Some smoothing was done for PDF's to alleviate rounding effects.

<sup>2</sup> Calculated by \$0.0673 PDM + \$1.62 PDF. The constants in this formula differ from those in effect at the time each Summary was released except 1/81.

Table 2.-- Average Predicted Difference (PD) for milk (PDM) in pounds, fat percentage (PD%) , fat (PDF) in pounds, and dollars (PD\$) for Brown Swiss, Milking Shorthorn, Red and White, and all breeds in the USDA-DHIA Sire Summaries

| Summary date      | All bulls |      |       |     |                   | Active AI bulls |        |       |     |                   | Inactive AI bulls <sup>1</sup> |      |       |     |                   | Non-AI bulls |      |       |     |                   |
|-------------------|-----------|------|-------|-----|-------------------|-----------------|--------|-------|-----|-------------------|--------------------------------|------|-------|-----|-------------------|--------------|------|-------|-----|-------------------|
|                   | Number    | PDM  | PD%   | PDF | PD\$ <sup>2</sup> | Number          | PDM    | PD%   | PDF | PD\$ <sup>2</sup> | Number                         | PDM  | PD%   | PDF | PD\$ <sup>2</sup> | Number       | PDM  | PD%   | PDF | PD\$ <sup>2</sup> |
| Brown Swiss       |           |      |       |     |                   |                 |        |       |     |                   |                                |      |       |     |                   |              |      |       |     |                   |
| 10/74---          | 1,900     | -61  | +0.01 | -2  | -7                | 33              | +364   | +0.02 | +16 | +30               | 369                            | -30  | +0.01 | 0   | -2                | 1,498        | -78  | +0.01 | -2  | -8                |
| 5/75---           | 252       | +95  | +0.01 | +4  | +13               | 32              | +438   | +0.02 | +19 | +60               | 33                             | +172 | -0.02 | +4  | +18               | 187          | +23  | +0.01 | +1  | +3                |
| 9/75---           | 334       | +87  | .00   | +3  | +11               | 35              | +472   | .00   | +18 | +61               | 38                             | +81  | -0.01 | +2  | +9                | 261          | +36  | .00   | +1  | +4                |
| 1/76---           | 260       | +91  | .00   | +3  | +11               | 39              | +467   | -0.01 | +18 | +61               | 33                             | +80  | -0.01 | +1  | +7                | 188          | +15  | +0.01 | +1  | +3                |
| 5/76---           | 243       | +112 | .00   | +4  | +14               | 37              | +440   | -0.01 | +16 | +36               | 31                             | +151 | -0.03 | +2  | +13               | 175          | +35  | .00   | +1  | +4                |
| 9/76---           | 264       | +143 | -0.01 | +4  | +16               | 38              | +485   | -0.02 | +17 | +60               | 30                             | +206 | -0.03 | +4  | +20               | 196          | +66  | .00   | +2  | +8                |
| 1/77---           | 250       | +144 | -0.01 | +4  | +16               | 44              | +537   | -0.02 | +18 | +65               | 33                             | +138 | -0.03 | +2  | +13               | 173          | +45  | .00   | +2  | +6                |
| 5/77---           | 612       | +42  | .00   | +2  | +6                | 39              | +596   | -0.01 | +22 | +76               | 93                             | +54  | -0.01 | +1  | +5                | 480          | -6   | +0.01 | 0   | 0                 |
| 9/77---           | 291       | +152 | -0.01 | +4  | +17               | 45              | +680   | -0.03 | +23 | +83               | 43                             | +60  | -0.01 | 0   | +4                | 203          | +55  | -0.01 | +1  | +5                |
| 1/78---           | 281       | +229 | -0.01 | +7  | +27               | 45              | +691   | -0.02 | +24 | +85               | 43                             | +62  | -0.02 | 0   | +4                | 193          | +159 | -0.01 | +5  | +19               |
| 7/78---           | 364       | +174 | -0.01 | +5  | +20               | 41              | +753   | -0.03 | +26 | +93               | 52                             | +69  | -0.02 | 0   | +5                | 271          | +106 | .00   | +3  | +12               |
| 1/79---           | 368       | +221 | -0.02 | +7  | +26               | 46              | +788   | -0.05 | +25 | +94               | 55                             | +218 | -0.02 | +3  | +20               | 267          | +124 | -0.01 | +4  | +15               |
| 7/79---           | 402       | +222 | -0.02 | +6  | +25               | 46              | +782   | -0.05 | +25 | +93               | 55                             | +191 | -0.02 | +4  | +19               | 301          | +142 | -0.01 | +4  | +16               |
| 1/80---           | 349       | +272 | -0.02 | +8  | +31               | 45              | +803   | -0.06 | +25 | +95               | 48                             | +254 | -0.01 | +5  | +25               | 256          | +182 | -0.01 | +6  | +22               |
| 7/80---           | 367       | +300 | -0.03 | +9  | +35               | 40              | +911   | -0.06 | +29 | +108              | 53                             | +299 | -0.03 | +8  | +33               | 274          | +211 | -0.02 | +6  | +24               |
| 1/81---           | 374       | +332 | -0.03 | +10 | +39               | 44              | +863   | -0.05 | +28 | +103              | 49                             | +406 | -0.03 | +11 | +45               | 281          | +236 | -0.02 | +7  | +27               |
| Milking Shorthorn |           |      |       |     |                   |                 |        |       |     |                   |                                |      |       |     |                   |              |      |       |     |                   |
| 10/74---          | 459       | -7   | .00   | -1  | -2                | 6               | +624   | +0.01 | +24 | +81               | 90                             | -12  | .00   | -1  | -2                | 363          | -16  | .00   | -1  | -3                |
| 5/75---           | 61        | +135 | .00   | +5  | +17               | 5               | +758   | .00   | +28 | +96               | 5                              | +212 | +0.02 | +10 | +30               | 51           | +66  | .00   | +2  | +8                |
| 9/75---           | 95        | +158 | .00   | +6  | +20               | 8               | +742   | .00   | +28 | +95               | 5                              | +113 | -0.01 | +3  | +12               | 82           | +103 | .00   | +4  | +13               |
| 1/76---           | 96        | +166 | .00   | +6  | +21               | 8               | +779   | .00   | +29 | +99               | 5                              | +179 | +0.01 | +7  | +23               | 83           | +106 | .00   | +4  | +14               |
| 5/76---           | 101       | +238 | .00   | +9  | +31               | 8               | +745   | .00   | +28 | +95               | 6                              | +181 | -0.01 | +6  | +22               | 87           | +195 | .00   | +7  | +24               |
| 9/76---           | 111       | +228 | .00   | +8  | +28               | 9               | +704   | +0.01 | +26 | +89               | 6                              | +133 | -0.01 | +4  | +15               | 96           | +190 | .00   | +7  | +24               |
| 1/77---           | 109       | +232 | -0.01 | +8  | +29               | 10              | +762   | .00   | +28 | +97               | 5                              | +257 | .00   | +9  | +32               | 94           | +174 | -0.01 | +6  | +21               |
| 5/77---           | 209       | +137 | .00   | +5  | +17               | 10              | +743   | .00   | +27 | +94               | 34                             | +21  | +0.01 | +1  | +3                | 165          | +125 | .00   | +5  | +17               |
| 9/77---           | 200       | +177 | .00   | +7  | +23               | 10              | +841   | .00   | +30 | +105              | 33                             | +41  | +0.01 | +2  | +6                | 157          | +163 | .00   | +6  | +21               |
| 1/78---           | 212       | +162 | +0.01 | +7  | +22               | 10              | +856   | +0.01 | +32 | +109              | 33                             | +63  | +0.02 | +4  | +11               | 169          | +141 | +0.01 | +6  | +19               |
| 7/78---           | 221       | +165 | +0.01 | +7  | +22               | 9               | +829   | +0.03 | +33 | +109              | 35                             | +107 | +0.01 | +5  | +15               | 177          | +143 | +0.01 | +6  | +19               |
| 1/79---           | 194       | +280 | +0.02 | +12 | +38               | 11              | +865   | +0.02 | +34 | +113              | 35                             | +113 | +0.02 | +5  | +16               | 148          | +276 | +0.02 | +12 | +38               |
| 7/79---           | 104       | +456 | +0.02 | +19 | +61               | 12              | +794   | +0.02 | +31 | +104              | 14                             | +306 | +0.05 | +14 | +43               | 78           | +431 | +0.02 | +18 | +58               |
| 1/80---           | 116       | +499 | +0.02 | +20 | +66               | 12              | +903   | +0.02 | +35 | +117              | 11                             | +313 | +0.06 | +21 | +55               | 93           | +469 | +0.01 | +18 | +61               |
| 7/80---           | 120       | +585 | +0.01 | +23 | +77               | 11              | +985   | +0.02 | +38 | +128              | 12                             | +511 | +0.06 | +20 | +67               | 97           | +549 | +0.02 | +22 | +73               |
| 1/81---           | 119       | +629 | +0.02 | +25 | +83               | 13              | +979   | +0.03 | +39 | +129              | 8                              | +515 | +0.02 | +24 | +74               | 98           | +592 | +0.02 | +24 | +79               |
| Red and White     |           |      |       |     |                   |                 |        |       |     |                   |                                |      |       |     |                   |              |      |       |     |                   |
| 7/79---           | 4         | +234 | -0.02 | +5  | +24               | 1               | +212   | +0.04 | +13 | +35               | 0                              | 0    | .00   | 0   | 0                 | 3            | +241 | -0.04 | +2  | +19               |
| 1/80---           | 6         | +48  | -0.03 | -3  | -2                | 1               | +174   | +0.02 | +9  | +26               | 0                              | 0    | .00   | 0   | 0                 | 5            | +23  | -0.04 | -5  | -7                |
| 7/80---           | 8         | +47  | -0.04 | -3  | -2                | 1               | +52    | +0.02 | +9  | +18               | 0                              | 0    | .00   | 0   | 0                 | 6            | +29  | -0.05 | -6  | -8                |
| 1/81---           | 9         | +17  | -0.03 | -3  | -4                | 1               | +72    | +0.06 | +11 | +23               | 0                              | 0    | .00   | 0   | 0                 | 8            | +10  | -0.04 | -6  | -9                |
| All breeds        |           |      |       |     |                   |                 |        |       |     |                   |                                |      |       |     |                   |              |      |       |     |                   |
| 10/74---          | 55,886    | -150 | .00   | -6  | -20               | 1,018           | +368   | -0.03 | +10 | +41               | 6,664                          | -31  | .00   | -1  | -4                | 48,204       | -178 | .00   | -7  | -23               |
| 5/75---           | 6,153     | -47  | -0.01 | -3  | -8                | 996             | +425   | -0.03 | +12 | +48               | 573                            | +81  | -0.01 | +1  | +7                | 4,584        | -166 | .00   | -7  | -23               |
| 9/75---           | 8,319     | -66  | -0.01 | -4  | -11               | 1,072           | +452   | -0.04 | +12 | +50               | 729                            | +92  | -0.02 | +1  | +8                | 6,518        | -169 | .00   | -7  | -23               |
| 1/76---           | 7,621     | -32  | -0.01 | -3  | -7                | 1,135           | +444   | -0.04 | +11 | +48               | 679                            | +100 | -0.02 | +1  | +8                | 5,807        | -140 | -0.01 | -7  | -21               |
| 5/76---           | 6,976     | +2   | -0.02 | -3  | -5                | 1,081           | +501   | -0.05 | +12 | +53               | 653                            | +98  | -0.02 | +1  | +8                | 5,242        | -113 | -0.01 | -7  | -19               |
| 9/76---           | 6,551     | +28  | -0.02 | -2  | -1                | 1,142           | +511   | -0.05 | +13 | +55               | 604                            | +159 | -0.03 | +2  | +14               | 4,805        | -103 | -0.01 | -6  | -17               |
| 1/77---           | 8,210     | +10  | -0.02 | -3  | -4                | 1,303           | +484   | -0.05 | +11 | +50               | 668                            | +132 | -0.03 | +1  | +11               | 6,239        | -102 | -0.01 | -6  | -17               |
| 5/77---           | 12,295    | -20  | -0.01 | -3  | -6                | 1,173           | +558   | -0.05 | +14 | +60               | 1,318                          | +114 | -0.02 | +1  | +9                | 9,804        | -107 | -0.01 | -6  | -17               |
| 9/77---           | 8,690     | +55  | -0.03 | -2  | 0                 | 1,152           | +656   | -0.06 | +16 | +70               | 974                            | +160 | -0.03 | +1  | +12               | 6,564        | -65  | -0.02 | -5  | -12               |
| 1/78---           | 8,954     | +77  | -0.03 | -1  | +4                | 1,157           | +661   | -0.06 | +16 | +70               | 1,038                          | +201 | -0.04 | +2  | +17               | 6,759        | -42  | -0.02 | -5  | -11               |
| 7/78---           | 11,444    | +78  | -0.03 | -1  | +4                | 874             | +758   | -0.06 | +21 | +85               | 1,696                          | +263 | -0.04 | +5  | +26               | 8,874        | -24  | -0.02 | -4  | -8                |
| 1/79---           | 11,472    | +110 | -0.03 | 0   | +7                | 877             | +857   | -0.06 | +22 | +93               | 1,900                          | +269 | -0.04 | -1  | +16               | 8,695        | 0    | -0.01 | -2  | -3                |
| 7/79---           | 13,098    | +134 | -0.03 | +1  | +11               | 893             | +908   | -0.05 | +25 | +102              | 2,284                          | +296 | -0.04 | +5  | +28               | 9,921        | +27  | -0.02 | -2  | -1                |
| 1/80---           | 11,947    | +188 | -0.03 | +3  | +18               | 927             | +950   | -0.05 | +27 | +108              | 1,899                          | +378 | -0.03 | +6  | +35               | 9,121        | +71  | -0.02 | 0   | +5                |
| 7/80---           | 12,892    | +210 | -0.03 | +4  | +21               | 926             | +1,011 | -0.05 | +29 | +115              | 2,316                          | +411 | -0.03 | +11 | +45               | 9,649        | +85  | -0.02 | 0   | +6                |
| 1/81---           | 12,962    | +249 | -0.02 | +6  | +26               | 932             | +1,057 | -0.05 | +31 | +121              | 2,222                          | +457 | -0.03 | +13 | +52               | 9,808        | +125 | -0.02 | +2  | +12               |

<sup>1</sup> The PDM and PDF values for 1979 and later Summaries of inactive AI bulls computed by difference. Some smoothing was done for PDF's to alleviate rounding effects.

<sup>2</sup> Calculated by \$.0673 PDM + \$.162 PDF. The constants in this formula differ from those in effect at the time each Summary was released except for 1/81.

## Literature Cited

- (1) Grossman, M., and Wiggans, G. R. Average Predicted Differences from Winter 1979 through Summer 1980 Sire Summaries. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 56(6), pp. 1-3. 1980.
- (2) Powell, R. L., Norman, H. D., and Dickinson, F. N. Genetic means and trends of dairy sires in the United States. J. Dairy Sci. 63: 1455-1461. 1980.
- (3) Powell, R. L., and Shainline, W. E. Trends in genetic merit of dairy sires at initial proving. J. Dairy Sci. 62: 1655-1661. 1979.
- (4) Powell, R. L., and Wiggans, G. R. Requirements for calculation of a Sire Summary. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 56(6), pp. 4-6. 1980.
- (5) U.S. Department of Agriculture. Distribution of active artificial insemination (AI) sires summarized by level of Predicted Difference for milk and dollars. U.S. Dept. Agr. ARS-60-7, Dairy Herd Impr. Ltr. 52(5), pp. 7-12. 1976.
- (6) U.S. Department of Agriculture. Distribution of active artificial insemination (AI) sires summarized by level of Predicted Difference for milk and dollars. U.S. Dept. Agr. ARS-NE-60, Dairy Herd Impr. Ltr. 53(3), pp. 4-10. 1977.
- (7) U.S. Department of Agriculture. Distribution of active artificial insemination (AI) sires summarized by level of Predicted Difference for milk and dollars. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 54(5), pp. 4-9. 1978.

## CHANGES IN THE AIPL GENETIC EVALUATION PROCEDURES

By George R. Wiggans<sup>1</sup>

The primary mission of the Animal Improvement Programs Laboratory (AIPL) is to develop and apply advanced methods for the genetic improvement of dairy cattle. New techniques are incorporated into the sire and cow evaluation procedures from time to time.

The following changes were implemented in recent genetic evaluation runs.

January 1980

All records in AIPL files were projected with new factors. Records with last sample-day production were projected with factors based on last sample-day production<sup>2</sup> rather than on partial lactation production.<sup>3</sup> Those records without last sample-day production were projected by new factors based on partial lactation production.

Prior records of cows that had their identification changed but remained in the same herd were recycled and included in the next run. Previously these records had been sent back to the dairy records processing centers as records of possible twins.

Records of registered cows that had the same birth date and parents but were not identified as twins were accepted as twins if they had successive identification numbers.

July 1980

The required number of days in milk for a cow to appear on the Elite Cow Index was reduced from 150 to 100 days for a single lactation.

The size of the Elite Cow Index was reduced by 40 percent by raising the Cow Index Dollars requirement.

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<sup>2</sup> Wiggans, G. R., and Powell, R. L. Projection factors for milk and fat lactation records. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 56(1), 15 pp. 1980.

<sup>3</sup> McDaniel, B. T., Miller, R. H., and Corley, E. L. DHIA factors for projecting incomplete records to 305 days. U.S. Dept. Agr. Dairy Herd Impr. Ltr. 41(6), 21 pp. 1965.

The sire birth date restriction for determining which sires will be evaluated was changed. A sire must have been born within 21 years of the year of the current Sire Summary date to be evaluated.

A similar birth date restriction was imposed for daughters of sires. A daughter must have been born within 20 years of the Sire Summary date to be included in her sire's evaluation.

January 1981

The method of computing the Cow Index (CI) was changed following the procedure developed by Powell.<sup>4</sup> The new procedure includes information on more ancestors by incorporating the dam's CI into the formula for computing the cow's CI. Cows are sequenced by age; therefore, the most recently computed dam's CI is available when computing CI's. A cow with no new information on herself or no new evaluation on her sire does not have a new CI computed.

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<sup>4</sup> Powell, R. L. A procedure for including the dam and maternal grandsire in USDA-DHIA cow indexes. J. Dairy Sci. 61: 794-800. 1978.

# CODES USED IN THE NATIONAL COOPERATIVE DAIRY HERD IMPROVEMENT PROGRAM

Codes used for data exchange in the National Cooperative Dairy Herd Improvement Program are shown in tables 1-4. Table 1 presents species and breed codes for dairy cattle and goats. Termination codes and reasons for termination (definition) are in table 2. Table 3 lists the codes and tags for type of testing plans, and table 4 lists computing center codes and addresses.

Table 1.--Species and breed codes for dairy cattle and goats

| Species code | Species           | Breed code | Breed              |
|--------------|-------------------|------------|--------------------|
| 0-----       | Dairy cattle----- | A-----     | Ayrshire.          |
|              |                   | B-----     | Brown Swiss.       |
|              |                   | D-----     | Red Dane.          |
|              |                   | E-----     | Dutch Belted.      |
|              |                   | G-----     | Guernsey.          |
|              |                   | H-----     | Holstein.          |
|              |                   | J-----     | Jersey.            |
|              |                   | M-----     | Milking Shorthorn. |
|              |                   | N-----     | Norwegian Red.     |
|              |                   | P-----     | Red Poll.          |
|              |                   | S-----     | Simmental.         |
|              |                   | U-----     | Unknown.           |
|              |                   | W-----     | Red and White.     |
|              |                   | X-----     | Mixed breed.       |
|              |                   |            |                    |
|              |                   |            |                    |
| 1-----       | Dairy goat-----   | A-----     | Alpine.            |
|              |                   | B-----     | Oberhasli.         |
|              |                   | E-----     | Experimental.      |
|              |                   | L-----     | LaMancha.          |
|              |                   | N-----     | Nubian.            |
|              |                   |            |                    |
|              |                   | P-----     | Pygmy.             |
|              |                   | S-----     | Saenen.            |
|              |                   | T-----     | Toggenburg.        |
|              |                   | U-----     | Unknown.           |
|              |                   | X-----     | Mixed.             |

Table 2.--Termination codes and reasons for termination

| Code   | Reason for termination of animal's record                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0----- | Went dry or had 305 days in milk (normal).                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 1----- | Missed two or more consecutive tests following at least one valid test or had a period >75 days between consecutive tests, with the animal remaining in the herd in either case. The record up to the missed test should be coded 1; the complete record $\leq 305$ days for such a lactation should be coded 9. Some valid reasons for missed tests are (1) broken, spilled, or accidentally missed samples or (2) animal goes on show circuit during lactation.                        |
| 2----- | Sold for dairy purposes or testing of herd discontinued. This code allows animals to have subsequent records in different herds. The other sold or died codes indicate that no new records on the animal are expected.                                                                                                                                                                                                                                                                   |
| 3----- | Sold because of low production or any reason not identified specifically.                                                                                                                                                                                                                                                                                                                                                                                                                |
| 4----- | Sold because of reproductive problems.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 5----- | Sold because of disease, injury, or unspecified reasons.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 6----- | Died.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 7----- | Sold because of mastitis or other udder problems.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 8----- | Aborted at $\geq 152$ days from last breeding or at $\geq 200$ days in milk if no breeding date.                                                                                                                                                                                                                                                                                                                                                                                         |
| 9----- | Although not a reason for termination, this code indicates that the record is not to be used for genetic evaluations for any of the following reasons: (1) Lactation initiated by abortion; (2) complete record with two or more consecutive tests missed; <sup>1</sup> (3) record in which any two consecutive tests were >75 days apart; (4) no test within 75 days of calving or kidding; or (5) no test between freshening and termination date (such records need not be provided). |

<sup>1</sup> Valid part of record should have been submitted to USDA as code 1.

Table 3.--Codes and tags for type of testing plans

| USDA code                            | Tag            | Plan                                                               |
|--------------------------------------|----------------|--------------------------------------------------------------------|
| Official DHI plans (00-19)           |                |                                                                    |
| 00-----                              | DHI-----       | Official DHI.                                                      |
| 01-----                              | DHI-AP-----    | Official DHI AM/PM with Monitoring Device.                         |
| 02-----                              | DHI-APCS-----  | Official DHI with Alternate AM/PM Component Sampling.              |
| Official DHIR plans (20-29)          |                |                                                                    |
| 20-----                              | DHIR-----      | Official DHIR.                                                     |
| 21-----                              | DHIR-AP-----   | Official DHIR AM/PM with Monitoring Device.                        |
| 22-----                              | DHIR-APCS----- | Official DHIR with Alternate AM/PM Component Sampling.             |
| Owner-Sampler plans (40-59)          |                |                                                                    |
| 40-----                              | OS-----        | Owner-Sampler.                                                     |
| 41-----                              | OS-AP-----     | Owner-Sampler AM/PM.                                               |
| 42-----                              | OS-APCS-----   | Owner-Sampler with Alternate AM/PM Component Sampling.             |
| 43-----                              | OS-MO-----     | Owner-Sampler Milk Only.                                           |
| 44-----                              | OS-MO-AP-----  | Owner-Sampler AM/PM Milk Only.                                     |
| 45-----                              | OS-ACT-----    | Owner-Sampler with Average (Breed or Plant) Components Used.       |
| 46-----                              | OS-AP-ACT----  | Owner-Sampler AM/PM with Average (Breed or Plant) Components Used. |
| 47-----                              | OS-TCT-----    | Owner-Sampler with Trimonthly Component Tests.                     |
| 48-----                              | OS-MO-TMW---   | Owner-Sampler Milk Only with Trimonthly Milk Weights.              |
| Commercial plans (60-69)             |                |                                                                    |
| 60-----                              | Comm-----      | Commercial.                                                        |
| 61-----                              | Comm-AP-----   | Commercial AM/PM.                                                  |
| 62-----                              | Comm-APCS----- | Commercial with Alternate AM/PM Component Sampling.                |
| Supervised nonofficial plans (70-79) |                |                                                                    |
| 70-----                              | SS-----        | Supervised Sampling.                                               |
| 71-----                              | SS-AP-----     | Supervised Sampling AM/PM.                                         |
| 72-----                              | SS-APCS-----   | Supervised Sampling with Alternate AM/PM Component Sampling.       |
| 73-----                              | SS-MO-----     | Supervised Sampling Milk Only.                                     |
| 74-----                              | SS-MO-AP-----  | Supervised Sampling AM/PM Milk Only.                               |
| Basic plans (80-89)                  |                |                                                                    |
| 80-----                              | Basic-----     | Basic Management Information Plan.                                 |
| Other plans (90-99)                  |                |                                                                    |
| 98-----                              | Other-----     | Other dairy recordkeeping plans.                                   |

Table 4.--Dairy records processing center codes and addresses

| Code    | State             | Address                                                                               |
|---------|-------------------|---------------------------------------------------------------------------------------|
| 01----- | California-----   | Agri-Tech Analytics, P.O. Box 177, Tulare 93274.                                      |
| 03----- | Iowa-----         | DRPC, Kildee Hall, Iowa State University, Ames 50011.                                 |
| 04----- | Michigan-----     | Michigan DHI, P.O. Box 23158, Lansing 48909.                                          |
| 05----- | Minnesota-----    | DRPC, 101 Haecker Hall, University of Minnesota, St. Paul 55108.                      |
| 06----- | New York-----     | Northeast DRPL, B-28 Morrison Hall, Cornell University, Ithaca 14853.                 |
| 07----- | North Carolina--- | DRPC at Raleigh, P.O. Box 5065, North Carolina State University, Raleigh 27650.       |
| 09----- | Pennsylvania----  | DRPC, 9 Borland Laboratory, Pennsylvania State University, University Park 16802.     |
| 10----- | Utah-----         | DHI-Provo, P.O. Box 1427, Provo 84601.                                                |
| 11----- | Washington-----   | WSU Computing Center, 2147 CS/M Building, Washington State University, Pullman 99164. |
| 12----- | Wisconsin-----    | WDHIC, 6225 University Avenue, Madison 53705.                                         |

## CURRENT PUBLICATIONS DESCRIBING ASPECTS OF THE USDA BULL AND COW EVALUATIONS

The following publications describe aspects of the USDA bull and cow evaluations. Copies may be obtained from the Animal Improvement Programs Laboratory (AIPL), Animal Science Institute, Beltsville Agricultural Research Center, Beltsville, Md. 20705.

A procedure for including the dam and maternal grandsire in USDA-DHIA cow indexes. R. L. Powell. J. Dairy Sci. 61: 794-800. 1978.

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